

In The Claims:

1. (Currently Amended) An optical module, comprising:
at least one optical fiber having an end surface;
a gradient index rod lens, wherein the rod lens is placed at a position separated from the end surface of the at least one optical fiber by a space; and
an optical element that is separated from the rod lens, wherein outgoing light from the at least one optical fiber is inputted to the optical element via the rod lens, and light reflected by the optical element is occupied to the at least one optical fiber via the rod lens, and
wherein, when a distance between the rod lens and the optical element is longer than about 0.4 mm ~~a predetermined distance~~, and a lens length optimized for the distance is ~~equal to or less than a predetermined~~ in a range between 0.21 pitch and 0.1 pitch, the rod lens has end surfaces perpendicular to an optical axis.
2. Cancelled.
3. Cancelled.
4. (Original) The optical module according to claim 1,
wherein the rod lens has a parabolic gradient index along a radial direction,
and wherein, when a calculation of value L_0 of the distance L is computed according to the following formula based on a central axis refractive index n_0 of the rod lens, an index gradient constant $\sqrt{A}$, and the lens length Z ,
$$L_0 = 1 / (n_0 \times \sqrt{A} \times \tan(\sqrt{A} \times Z)),$$
 and
wherein the distance between the rod lens and the optical element is set shorter than the calculation value L_0 by a predetermined amount.
5. (Currently Amended) The optical module according to claim 4, wherein the predetermined amount ~~value used for setting the distance between the rod lens and the optical element shorter than the calculation value L_0~~ is about 0.3 mm.

6. (Currently Amended) An optical module, comprising:
at least one optical fiber having an end surface;
a gradient index rod lens, wherein the rod lens is placed at a position separated
from the end surface of the at least one optical fiber by a space;
an optical element that is separated from the rod lens, wherein outgoing light from
the at least one optical fiber is inputted to the optical element via the rod lens, and light
reflected by the optical element is occupied to the at least one optical fiber via the rod
lens; and
wherein, when a distance between the rod lens and the optical element is longer
than a predetermined distance, and a lens length optimized for the distance is equal to or
less than a predetermined pitch, the rod lens has end surfaces perpendicular to an optical
axis. ~~The optical module according to claim 1,~~
wherein the at least one optical fiber is a single incoming optical fiber that is
located at an incoming side of the rod lens and is coaxial with the rod lens,
wherein an optical circulator is connected to the incoming optical fiber, the
optical circulator having a first terminal, a second terminal, and a third terminal,
wherein light inputted to the first terminal is outputted from the second terminal
to the incoming optical fiber, reflected by the optical element, and sent to the incoming
optical fiber via the rod lens, and wherein light inputted to the second terminal is
outputted only to the third terminal.
7. (Original) The optical module according to claim 1,
wherein the at least one optical fiber comprises an incoming optical fiber and an
outgoing optical fiber, wherein the incoming optical fiber causes light to reach the rod
lens from a part displaced from the optical axis, and wherein the outgoing optical fiber is
located at a position to which light that is reflected by the optical element and passes
through the rod lens is coupled.

8. (Currently Amended) The optical module according to claim 12,
wherein the at least one optical fiber comprises an incoming optical fiber that is located at an incoming side of the rod lens and another optical fiber located at a position to which light that is reflected by the optical element is coupled via the rod lens,

wherein the two optical fibers are held in parallel by a capillary, and wherein end surfaces of the optical fibers are arranged to be spaced from the end surface of the rod lens by an equal distance, and

wherein optical axes of the two optical fibers are substantially parallel to the optical axis of the rod lens.

9. (Currently Amended) An optical module using a gradient index rod lens, comprising:

first and second optical fibers, wherein the first and second optical fibers each have an end surface, and are arranged parallel to each other;

a gradient index rod lens, wherein the rod lens is placed at a position separated from the end surfaces of the first and second optical fibers by a space; and

an optical element that is separated from the rod lens,

wherein outgoing light from the first optical fiber is inputted to the optical element via the rod lens, and light reflected by the optical element is coupled to the second optical fiber via the rod lens,

wherein the end surfaces of the optical fibers are inclined relative to a plane perpendicular to the optical axis of the rod lens by a predetermined angle, and

wherein, when a distance between the rod lens and the optical element is longer than about 0.4mm ~~a predetermined value~~, and a lens length optimized for the distance is in a range between 0.21 pitch and 0.1 pitch inclusive ~~equal to or less than a predetermined pitch~~, the rod lens has end surfaces perpendicular to an optical axis.

10. Cancelled.

11. Cancelled.

12. (Original) The optical module according to claim 9, wherein the rod lens has a parabolic gradient index along a radial direction, and wherein, when a calculation value L_0 is computed according to the following formula based on a central axis refractive index n_0 of the rod lens, an index gradient constant $\sqrt{A}$, and the lens length Z ,

$$L_0 = 1 / (n_0 \times \sqrt{A} \times \tan(\sqrt{A} \times Z)), \text{ and}$$

wherein the distance between the rod lens and the optical element is set shorter than the calculation value L_0 by a predetermined amount.

13. (Original) The optical module according to claim 9, wherein the first and second optical fibers are arranged to contact each other, and wherein contacting portion of the optical fibers are located on the optical axis of the rod lens.

Please add the following new claims (14-21):

14. (New) The optical module according to claim 6, wherein the predetermined distance is about 0.4 mm.

15. (New) The optical module according to claim 14, wherein the optimized lens length of the rod lens is in a range between about 0.21 pitch and 0.1 pitch inclusive.

16. (New) The optical module according to claim 15, wherein the rod lens has a parabolic gradient index along a radial direction, wherein when a calculation of value L_0 is computed according to the following formula based on a central axis refractive index n_0 of the rod lens, an index gradient constant $\sqrt{A}$, and the lens length Z ,

$$L_0 = 1 / (n_0 \times \sqrt{A} \times \tan(\sqrt{A} \times Z)), \text{ and}$$

wherein the distance between the rod lens and the optical element is set shorter than the calculation value L_0 by a predetermined amount.

17. (New) The optical module according to claim 16, wherein the predetermined amount is about 0.3 mm.

18. (New) The optical module according to claim 6, wherein the optical element is a dichroic mirror.

19. (New) The optical module according to claim 6, wherein a return loss of optical light through the optical module is greater than 55 dB.
20. (New) The optical module according to claim 6, wherein the optical element is a dielectric multi-layer film.
21. (New) The optical module according to claim 6, wherein the optical element is a half mirror.